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(71)(72) Applicant and Inventor: INFANTE, Mario [IT/IT]; Largo Enea Bortolotti, 10, I-00146 Roma (IT).

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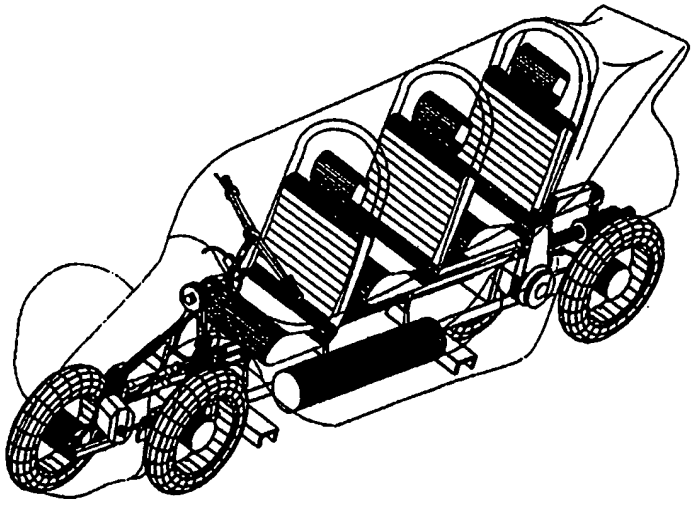

(57) Abstract

The invention of this particular vehicle, due to its special characteristics, is an important innovation in solving the problems of traffic jams and parking spaces. It has the manoeuvrability of a motorcycle, and all the comforts of a car. Its characteristics are: 1) reduced size, with seats (preferably three) positioned in a longitudinal direction; 2) inclination of the vehicle through the internal side of the curve (such as with a motorcycle). The second point is possible because of the anti-rolling system. It works by a system of ascending and descending wheels; ascending if they are internal to the curve, descending for the outside, controlled by the driver with a common bar normally used on motorcycles. The same bar can also be inclined to lean the vehicle either to the left or to the right. This system can also be used in traditional cars, off-road vehicle and three-wheeled vehicles, as it would improve their safety in curves at higher speeds.

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DESCRIPTION

FOUR-WHEELED MOTOR VEHICLE WITH INWARDLY-INCLINING BODY AND WHEELS ON BENDS

Technical field

My invention is an important innovation in the field of traffic problems. It helps solve two of the most serious problems of modern cities, that of finding a parking space, that of facing frequent traffic jams.

Backgrount Art

These problems are accentuated by the large size of vehicle commonly used. The aim of this invention is to eliminate, or to reduce, the above mentioned difficulties.Thanks to the "Four wheeld anti-roll motor-bike" the users can retain the comfort of driving a car while enjoyng the manoeuvrability of a motorcycle.

Disclouser of invention

The first characteristic of this invention is its reduced size; similar to that of a common motorcycle with a medium power engine. The reduced size is obtained by putting the seats (preferably three) in a longitudinal direction, whilst reatining all the confort and safety of a standard car.

The second characteristic is the built-in anti-rolling system which prevents any possible overturning while travelling at high speeds in curves. This anti-rolling system consist of ascending and descending wheels. The anti-rolling system can be powered by any combination of hydraulics, electrics, electronics or electromechanics. The system allows the vehicle to lean to the left and to the right in the same manner as a motorcycle.

This way of leaning is necessary to cope with sharp turns at high speed. The anti-rolling system that is used "Four wheeled anti-roll motor-bike" can also be used in traditional cars to improve their safety in curves. The anti-rolling system can also equip off-road vehicles.

The direction of the "Four wheeled anti-roll motor-bike" is given by a common bar as normally used on motorcycles. The same bar can also be inclined to lean the vehicle either to the left or to the right. The leaning of the vehicle could also be controlled with pedals or other switches conveniently placed.

Driving the "Four wheeled anti-roll motor-bike" in curves would only require steering the bar in the direction of the curve. To drive in curves at higher speeds besides steering the bar it would be necessary to lean the bar itself. The amount of leaning is in proportion to the speed and to the radius of the turn.

In the case of no pressure being exerted by the driver on the control bar the system returns to the center position itself. The whole system described so far can also be applied to three wheeled vehicles (either front wheel or back wheel).

This invention is preferably equipped whith an automatic gear shift, electrical system in accordance whit current road regulations, a normal handbrake, a dashboard, air conditioning and other comforts.

The fore and aft shock absorbers are free from each other and of single-beam type.The fore and the aft shock absorbers are linked respectively to the fore and to the aft platform balance. Both the shock absorbers are linked through a shaft of attitude platform balance. The chassis is of single beam type. On the chassis are mounted both the attitude platform balance, joints, bearings, seats, roll bars, bumpers and engine. The transmission is an automatic type or clutch (possibly with reverse), with differentiale, semi axle-shafts and homocinetic joints. In the case of a tail wheel type version, the transimmion is of chain type or of cardan joint with reverse.

The leaning system is powered either with a hydraulic pump or elerctric generator both engine driven. In either case there is an anti block system that brings everything back to the mechanical system in case a malfunction should arise. The mechanical system consists of springs and appropriate shock absorbers.

Brief description of drawings

The above said characteristics of this invention are self evident in the following drawing. The chosen version in the drawing is only for the purpose of giving a better view of the invention, and does not limit the invention itself to the following drawing.

DRAWING 1/8:
Shows an axonometric view of the complete "Four Wheeled Anti-Roll Motor-Bike" in its normal position.

DRAWING 2/8:
Also in an axonometric view, shows the "Four Wheeled Anti-Roll Motor-Bike" leaning left as it would in a tight left-hand road curve.

DRAWING 3/8:
Side view of the vehicle in a normal position.

DRAWING 4/8:
Plane view of the vehicle.

DRAWING 5/8:
Frontal and rear view of the vehicle.

DRAWING 6/8:
The same views as dr.5/8 leaning left.

DRAWING 7/8:
An axonometric view of the chassis and mechanical interior.

DRAWING 8/8:
Detailed view of Fig.10 frontal in normal position and detailed view of Fig. 11 in leaning position.

Best mode for carryng out the invention

Using these drawings it is now possible to give a detailed description of the various components illustrated and explain the dynamics of their functions.

In DRAWING **1/8** -Fig.1: 1 indicates the oscillating bar of the front left suspension, while 2 indicates the rear oscillating bar. 3 and 4 indicate the relevant supports of this suspension. 5 indicates the chassis, 6 the leftside petrol tank, 7 and 7' indicate the chrome trim. 8 and 8' indicate the front and rear attitude platform balance which can be seen more clearly in the following drawings.
35, incorporated in the balance handle 18, is the hydraulic diverter which mixes the oil that goes to the hydraulic piston 22, which in turn activates the platform balance rear 8', in ordre to determine the solidity of the vehicle. 34 is crank pin that works with 18, 12 is the steering box and 21, 21' and 21" are the seats. 40 is the added homocinetic that transmits the mechanical rotation of the balance handle 18, through the crown gears 38 and the transmission chain movement 39, to the balance platform front 8 to mechanically determine the inclination of the vehicle. 33, 33' and 33" are the security roll bars. 41 is the front brake and 42 the rear brake.

DRAWING **2/8** -Fig.2, shows the vehicle leaning to the left in a tight lefthand curve. This happens when the driver uses the inclination and the rotation of the balance handle 18 at the same time, (in this case on the left), to raise the inside wheels (relative to the curve) and lower the outside wheels, commanding the front wheels to follow the arc of the curve.

In DRAWING **3/8** -Fig.3: a side view of the front oscillating suspension bar is again seen 1. 2 shows the rear oscillating suspension bar, while 3 and 4' are the relative suspension supports. 5 indicates the chassis, 6 the left petrol tank, 7 and 7' the chrome trim and 8 and 8' the front and rear attitude platform balance which can be seem more clearly in the following drawings.
9 is the engine and/or propulsion; 10, 10' and 10" are the arm supports of the attitude platform balance. 11 and 11' are the oil conductors of the hydraulic diverter 35 which is incorporated in the balance handle 18. 12 indicates the steering box, 13 its pipe, 31 the cardanic joint. 21, 21' and 21" are the seats. The already seen homocinetic 40 connected to the crown gears 38 and to the chains 39 anchored to the front platform balance 8 (seen better in drawings 5/8 and 6/8) make up the secondary mechanical safety system for the inclination of the vehicle. This system is always operative, even in cases of engine or generator failure. Please note that the added homocinetic 40 is telescopic, which always the balance 18 to mechanically transmit the inclination of the vehicle.

In DRAWING **4/8** -Fig.4: 14 and 14' indicate the platform balance windbraces that support it. 5 is the chassis and 15, 15', 15" and 15"' are the door supports that form a part of the chassis itself. 16 is the differential gear, 17 and 17' are the steering wheel connecting rods with relative round pins. 18 is the leader balance handle. 6 and 6' are petrol tanks that we have already seen in drawing 3/8. 12 indicates the steering box. 19 is the hydraulic pump which pulls the engine, suppling and maintaining hydraulic pressere. 36 is the oil pump conductor to the hydraulic diverter 35 (already seen in drawing 3/8).

The hydraulic diverter 35 which is incorporated in the balance handle 18, and depending on the handle's position, diverts the oil that flows through tubes 11 and 11' reaching the hydraulic piston 22 (visible in dr. 7/8 and 8/8) which is anchored to the rear platform balance 8' to determine hydraulically the inclination of the vehicle to the left or right. The hydraulic system of the vehicle consists of: pump 19, conductor 36, hydraulic diverter 35 (dr.3/8), oil conductors 11 and 11', hydraulic piston 22, (dr.7/8 and 8/8), which are connected to the hydraulic beam 23 of the rear platform balance 8'. The inclination and security system of the vehicle consist of: the added homocinetic 40, the crown gears 38 and the chains 39 connected to the front of the platform balance 8 (dr.1/8). Obviously both systems are controlled by the balance handle 18 at the same time. The front and rear kinematisms (8 and 8') are connected throught the kinematism shaft, 7 and 7' (dr.3/8). Therefore the two systems control the inclination of the two kinematisms 8 and 8'. 20 and 20' are the telescopic semi axis. 37 is one of the relative homocinetic joint, and 32''' is one of the 4 shock absorbers with incorporated springs which help the centralized mechanical action of vehicle while diminishing possible oscillations.

In DRAWING **5/8** -Fig.**5** represents the front view of the vehicle and Fig.6 the rear view. 21 of fig.5 shows the driver's seats. 8 is the front of the platform balance. 18 is the balance handle. 35 is the hydraulic diverter, 24 and 24' are the front wheels and brakes, 17 is the shaft of the steering wheel, 12 is the steering box, 3 and 3' are the front suspension supports and 25 and 25' are the interior spring shock absorbes. In Fig.6, 8' shows the rear platform balance and 9 is the engine and or propulsion. 19 is the hydraulic pump and 24'' and 24''' are the rear wheels and brake systems. 4 and 4' are the rear suspension supports; 16 is the differential gear and in 20 and 20' the telescopic semi axis can be seen again with the relative homocinetic joints 37 and 37'. 23 is the hydraulic piston rod of 22 (not visible in the drawing), which operates the rear platform balance. (both seen in dr. 8/8).

In DRAWING **6/8** -Fig.**7** and **8**, shows the front and rear views of "Four wheeled anti-roll Motor-Bike" (already illustrated in drawing 5/8), can be seen in a leaning position. Having received the command from control bar 18, the inside wheels to the curve have been raised, while the external wheels have been lowered, resulting in an inclination of the chassis 5 which remains solidly connected with the three seats, 21, 21' and 21''.
In Fig.8 the rear of the vehicle is shown. The rear suspension supports 4 and 4' actived by the poll 23 (of the hydraulic piston 22) have put the vehicle in a left leaning position. This has been executed by the up position of internal 4' and the down position of the external 4. "Making" the curve depends onturning control bar 18 in the appropriate way. The absolute independence between leaning and turning garantees the correct combination of the two commands (inclination and turning), in order to handle any situation on the road.

DRAWING **7/8** -Fig.**9**, shows the chassis and inside mechanism of the invention (leaning to the left). 7 and 7' are the platform balance shafts connected to the chassis 5 by bearing joints 10, 10' 10''. 14 and 14' are respectively the front and rear wind braces which are connected to the kinematisms 8, 8' and the kinematisms shafts 7 and 7'.

This is to absorb the shocks caused by rough terrain and pavement. Between the wind braces and the chassis there is a safety stop to limit the leaning of the vehicle. The shock absorbers are completely independent, no matter in which direction the vehicle is leaned or the amount of leaning. The perfect syncronism between the mechanic and hydraulic leaning system. Both the systems start from the same control (control bar) 18. The mechanic leaning system goes to the front platform balance 8 by the homokinetic joint 40, crown gears 38 and the like chains 39. The hydraulic leaning system goes to the rear platform balance 8' by hydraulic oil through the shunter 35, hydraulic hoses 11, 11', hydraulic piston 22 and the pole 23. It is obvious that both the systems have the same effect because linked to each other by the kinematism shafts 7, and 7'.

DRAWING **8/8** shows the details of rear attitude platform balance. Fig.**10** represents the normal position and Fig.**11** the leaning position. The platform balance is anchored at chassis 5 by bearings 26 and oscillating arms of shock absorbes 4 and 4' by bearings 27 and 27'. The hydraulic piston 22, anchored to the oscillating arms by the hydraulic pole 23 and bearings 28 and 28', is free to move all around the chassis with an alternating vertical movement, thanks to the sliding rails 29 and their bearings 30 and 30'. The alternate vertical sliding of the hydraulic piston is necessary to compensate for the leaning of the vehicle. (Shown in Fig.10 and Fig.11). The maximum range of the hydraulic pole 23 corresponds to the maximum degree of inclination of the vehicle. 11 and 11' are the hydraulic oil lines of the regulating attitude piston that join the hydraulic switch 35. 32 and 32' are shock absorbes with internal springs with twofold purposes: the springs help the safety self-centering mechanical action and the shock absorbers help to dampen any possible oscillations of the platform balance 8 and 8'.

No matter what materials or variants in design are used to make the "Four Wheeled Anti-Roll Motor-Bike", it remains the vehicle herein described.

CLAIMS

1) FOUR WHEELED ANTI-ROLL MOTOR-BIKE: a four-wheeled vehicle with a reduced width, with seats placed on the longitudinal axis of the vehicle itself. It can travel at relatively high speeds without the danger of flipping over in tight curves. The "Four wheeled anti-roll motor-bike" behaves like a normal motorcycle and can lean in the same direction of the curve.

2) FOUR WHEELED ANTI-ROLL MOTOR-BIKE: according to the preceding claim, the vehicle can lean during a curve as a result of a swinging command bar and or switches and or levers and or pedals, activated by the driver.

3) FOUR WHEELED ANTI-ROLL MOTOR-BIKE: according to the preceding claims, has the command bar controlled by a "power" system, which can be driven either hydraulically, electrically, electrical-mechanically or electronically. To improve the vehicle's "road-holding" the system has a platform balance that allows the inside wheels to the curve to ascend, and external wheels to descend.

4) FOUR WHEELED ANTI-ROLL MOTOR-BIKE: according to the preceding claims, an appropriate machanical backup system, always on and controlled at the same time as the hydraulic and or electric and or electronic and or electrical-mechanically applied to the platform balance. This backup system garantees an additional manual safety.

5) FOUR WHEELED ANTI-ROLL MOTOR-BIKE: according to the preceding claims, the platform balance (front and rear) anchored to the chassis have a simultaneous movement, because they are paired between the platform balance shafts and the wind braces. These wind braces also act as absorbers of structural stress of the front and rear carriage. Another important purpose of these windstructurs is to strengthen the chassis.

6) FOUR WHEELED ANTI-ROLL MOTOR-BIKE: according to the preceding claims, the vehicle has a safety limiting leaning system. With this system it is impossible to go beyond certain degrees of lateral inclination.

7) FOUR WHEELED ANTI-ROLL MOTOR-BIKE: according to the preceding clims, when the driver or rider does not exert any pressure on the command bar the safety self-centering system of the "Four wheeled anti-roll motor-bike" returns everything to a neutral position.

8) FOUR WHEELED ANTI-ROLL MOTOR-BIKE: according to the preceding claims, the directional control is given by the command bar, or steering wheel. These are absolutely independent from the inclination of the vehicle itself. The inclination is controlled by the system previously described.

9) FOUR WHEELED ANTI-ROLL MOTOR-BIKE: according to the preceding claims, the lateral inclination system can be applied to vehicles with a wider chassis, (such as cars), because the vehicle stability would be improved in any case.

10) FOUR WHEELED ANTI-ROLL MOTOR-BIKE: according to the preceding claims, the lateral inclination system can also be applied to three wheeled vehicles either front or rear wheel.

11) FOUR WHEELED ANTI-ROLL MOTOR-BIKE: according to the preceding claims, the lateral inclination system can also be applied to the field of "Off-road" vehicles, because of it's stability improving ability.

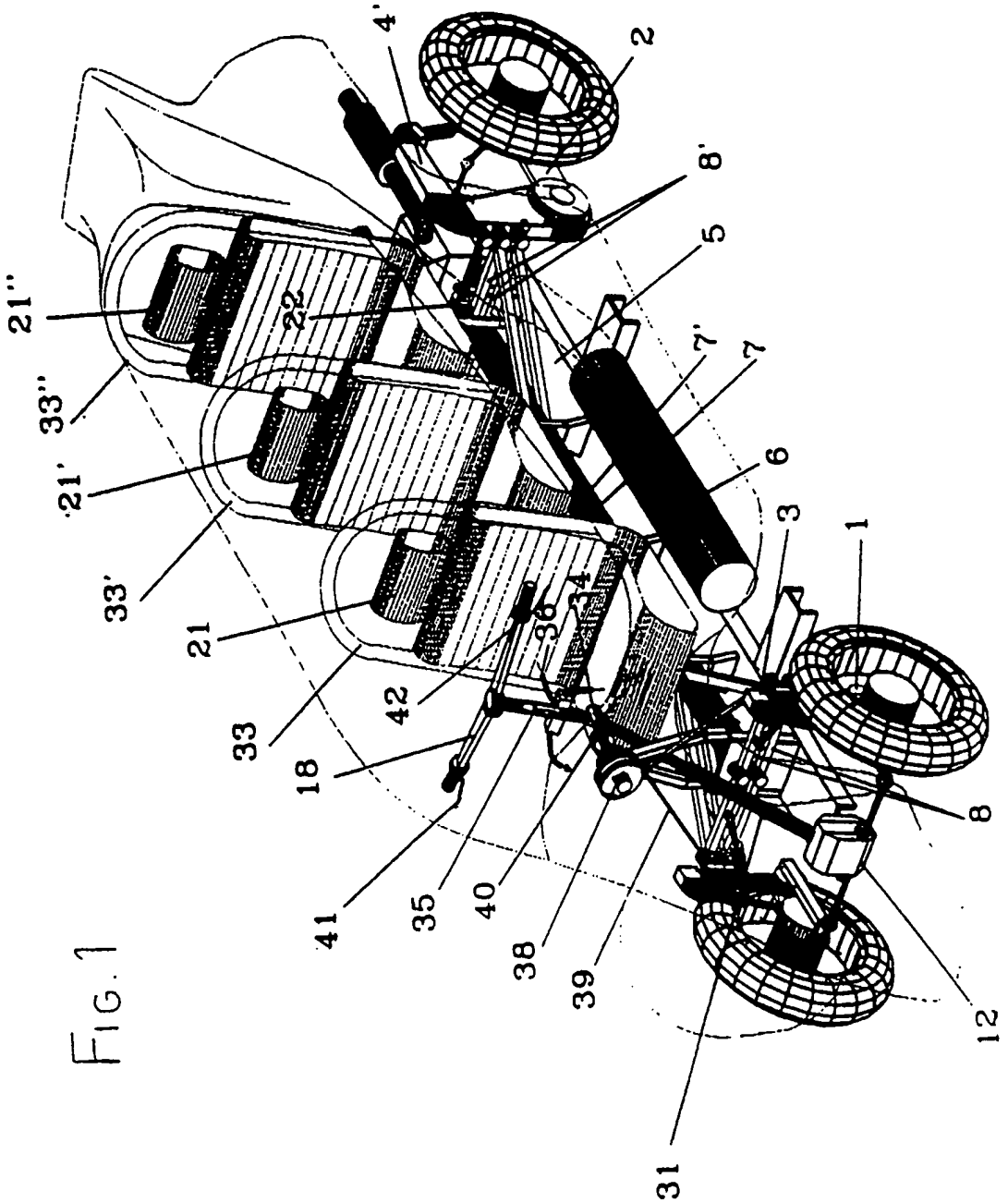

FIG. 1

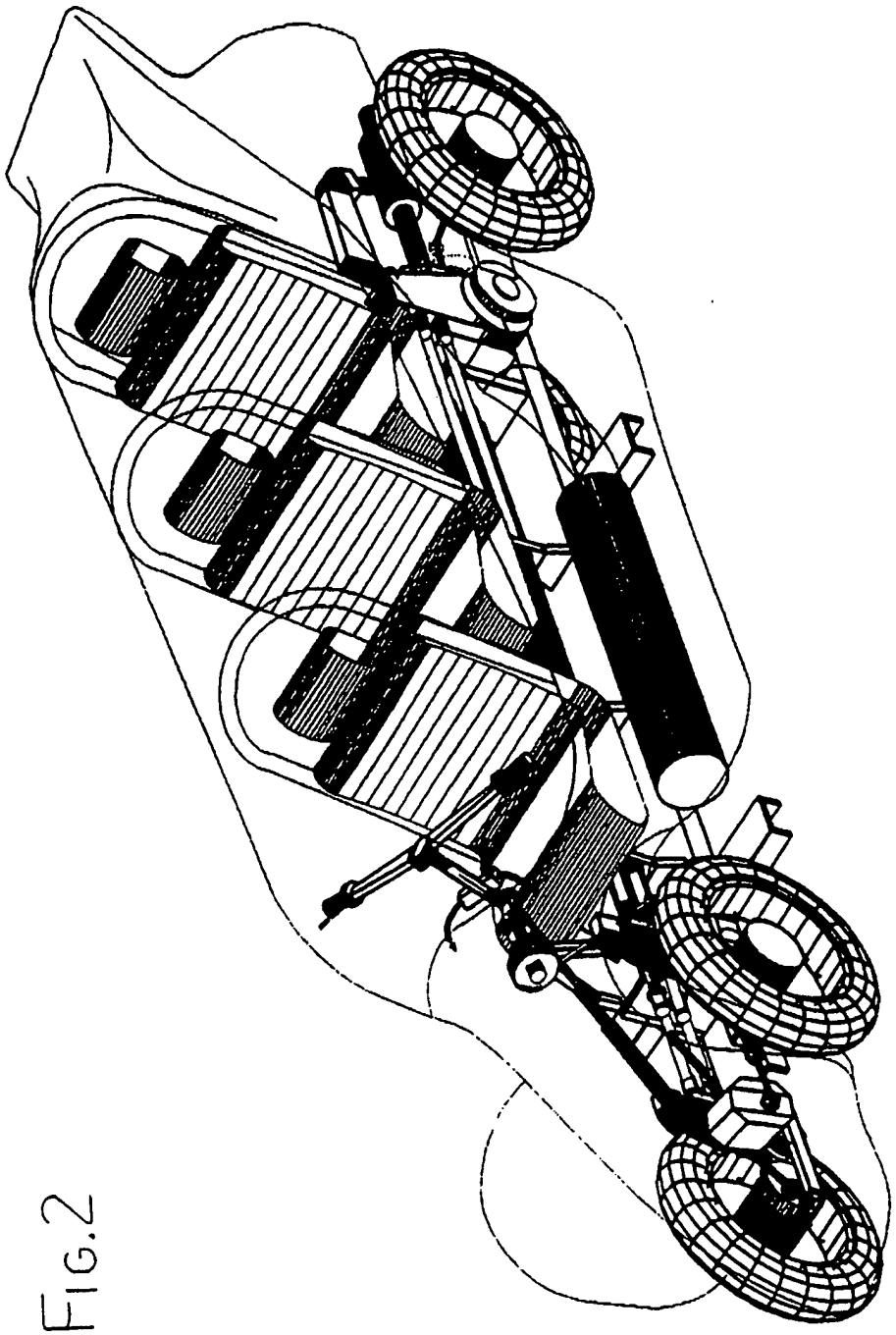

FIG.2

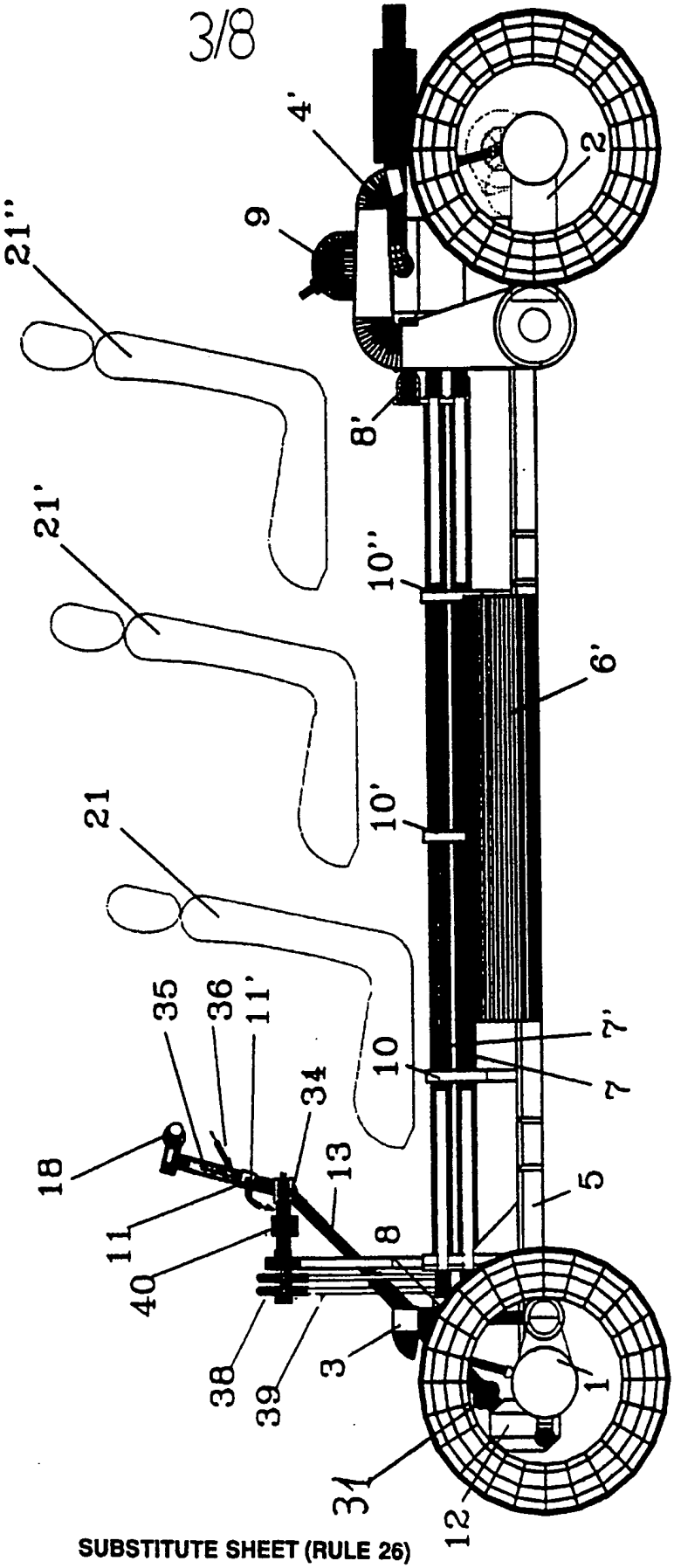

FIG.3

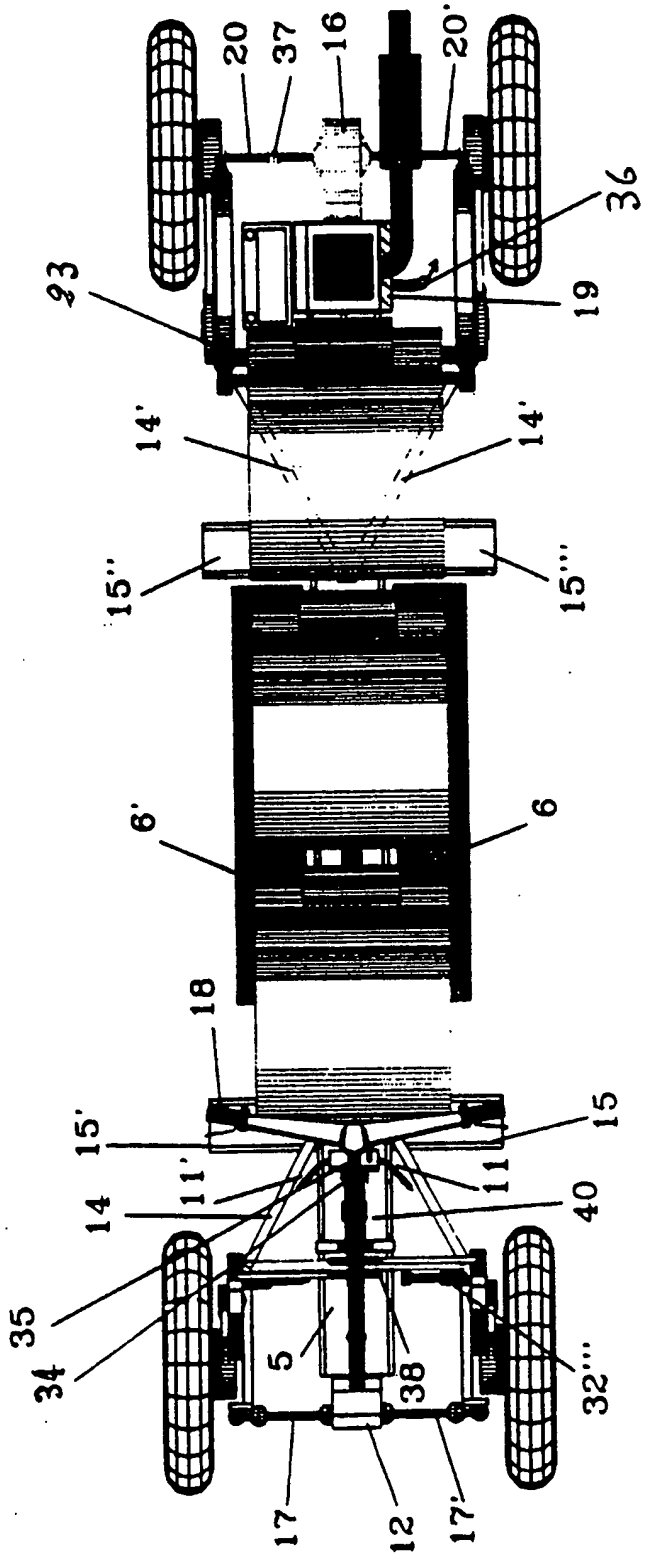
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FIG. 4

Fig.6

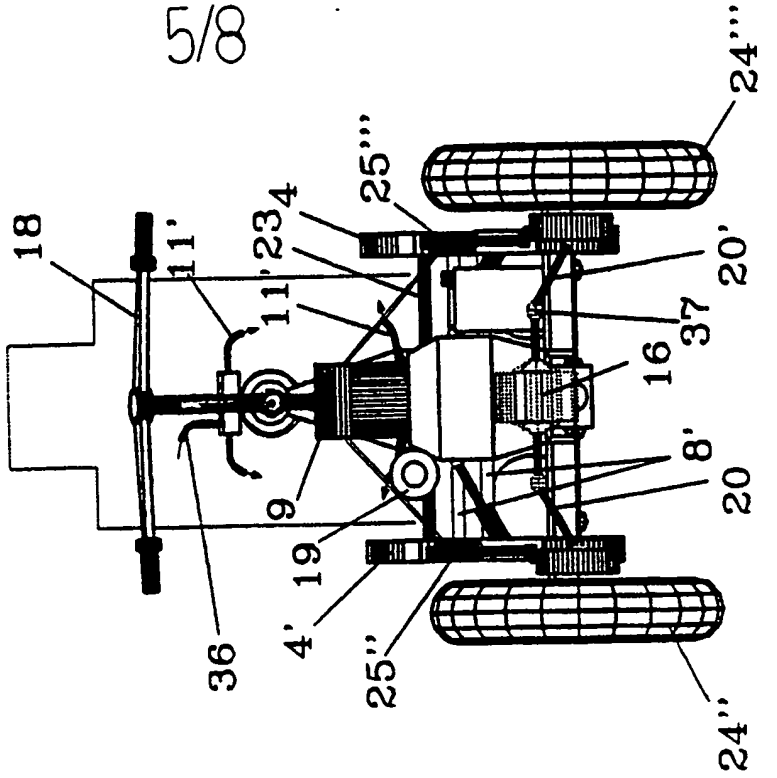
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Fig.5

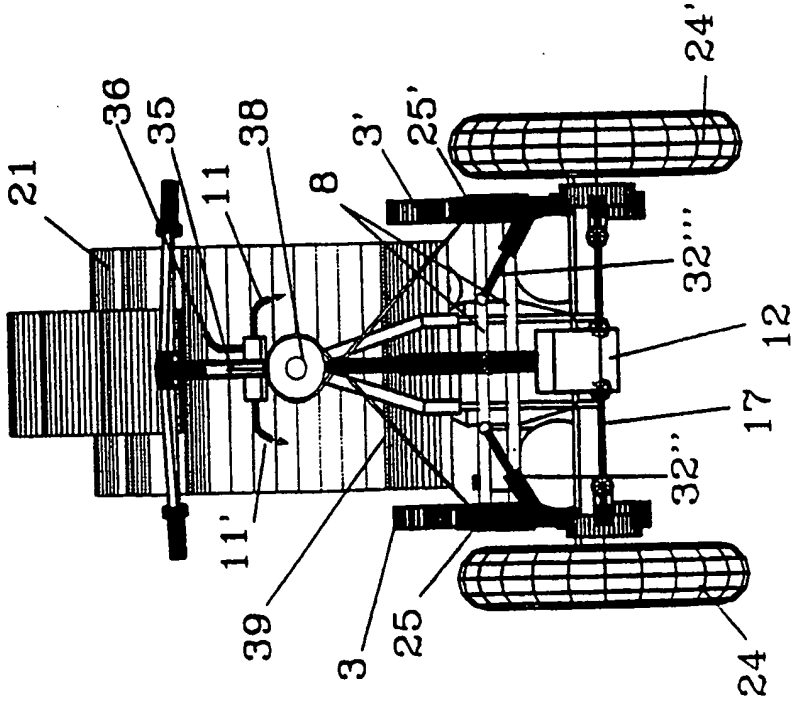
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Fig.8

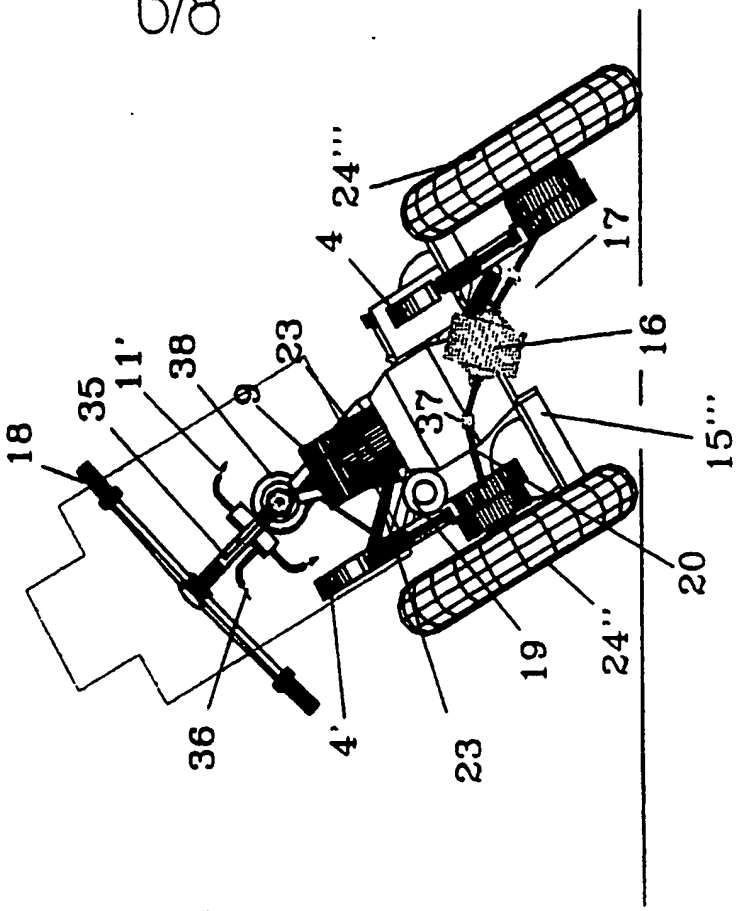
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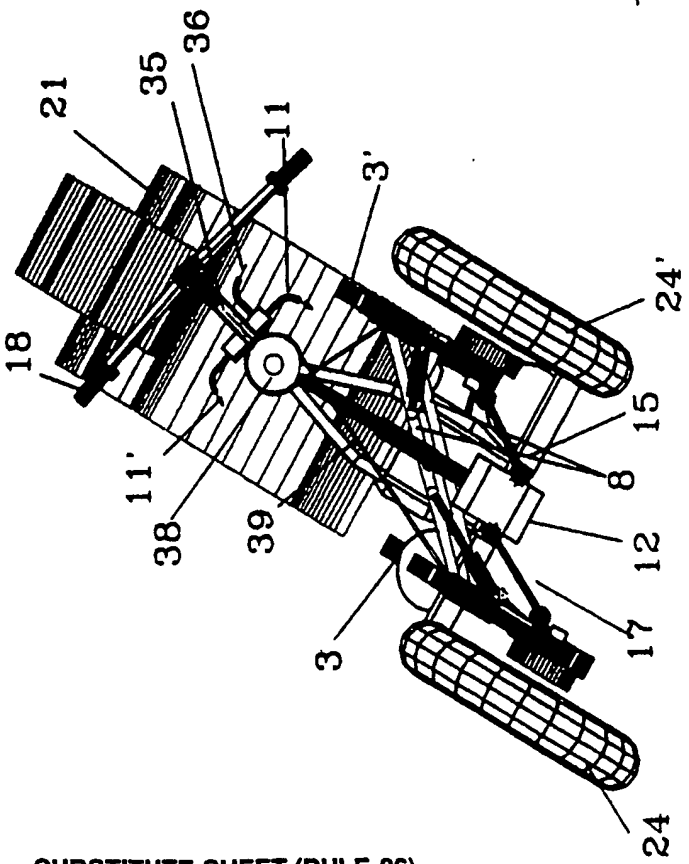
Fig.7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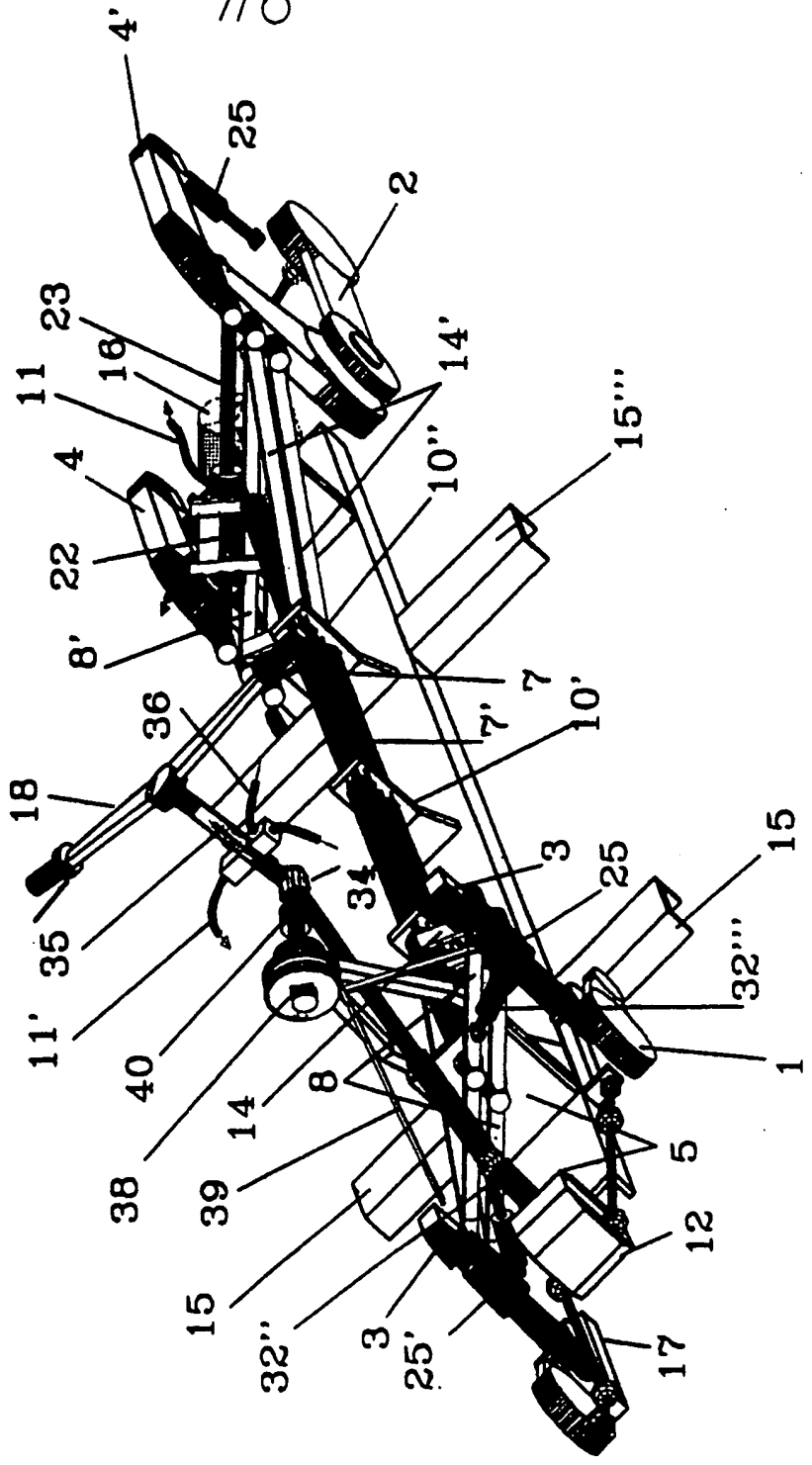
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FIG. 9

Fig.11

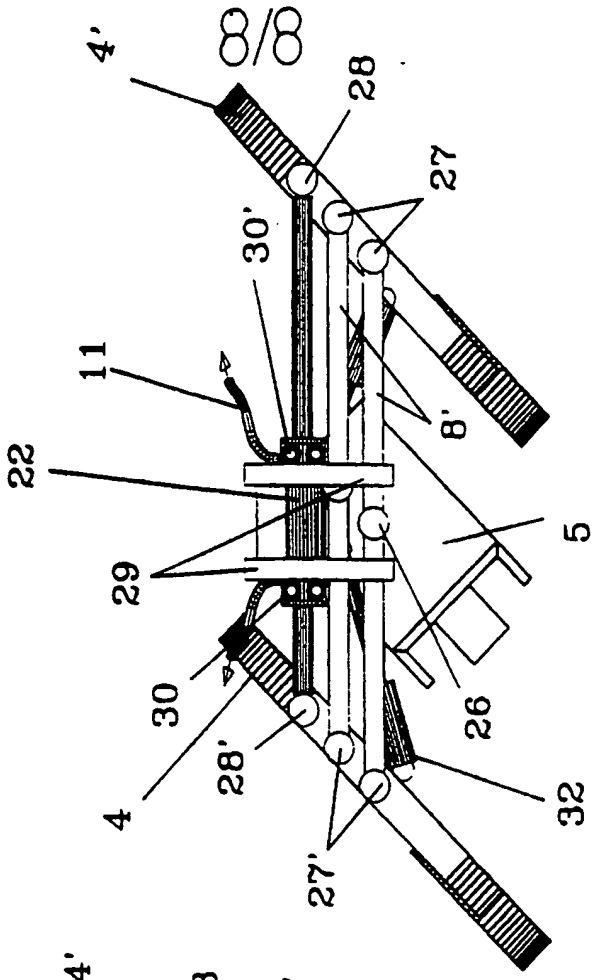
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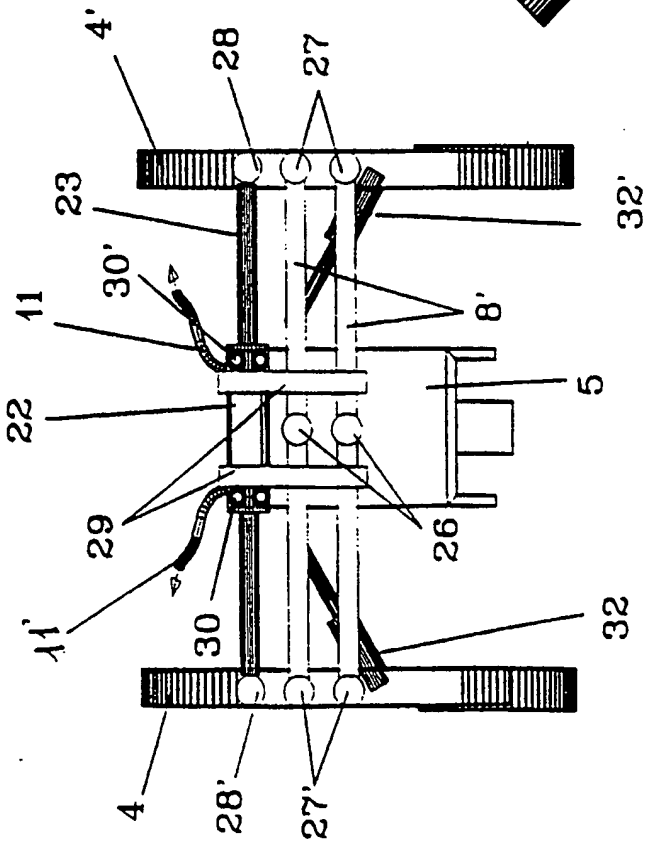
Fig.10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INTERNATIONAL SEARCH REPORT

Inter ıal Application No
PCT/IT 96/00167

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 B62D9/02 B60G21/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 B62D B60G B62K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 2 279 047 A (DOVISON DAVID) 21 December 1994 see the whole document	1-3,5,6, 8,10
Y	---	4,7,9
Y	GB 775 405 A (DAIMLER-BENZ AKTIENGESELLSCHAFT) 22 May 1957 see page 2, line 97 - page 3, line 122; figures	4,7,9
A	---	1-3,5,6
A	AT 394 694 B (PICHLER HUBERT) 25 May 1992 see page 4, line 14 - page 5, line 15; figures	1,3,10

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6 December 1996	17.12.96

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Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 626 307 A (DOVERI MARCO) 30 November 1994 see column 3, line 10 - column 5, line 13; figures -----	1-3,10

1

INTERNATIONAL SEARCH REPORT

information on patent family members

Inter nal Application No
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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		FR-A- 1134115	08-04-57
		US-A- 2961254	22-11-60
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